6080A/82A

SYNTHESIZED RF SIGNAL GENERATOR

Remote Programming Reference Guide

Giga-tronics

SPECIAL FUNCTIONS

SPECIAL FUNCTION DESCRIPTION	FRONT PANEL	REMOTE COMMAND
RF OUTPUT FREQUENCY		
Relative frequency mode	20,21	FREQ_REL
Enable phase adjustment	701	PHASE
Zero phase adjust reference	702	PHASE_ZERO
External ref. input frequency	760,761	EXTREF_FREQ
Low-noise external reference	950, 951	LOWNOISE
RF OUTPUT AMPLITUDE		
Relative amplitude mode	30,31	AMPL_REL
Fixed-range amplitude	50,51	AMPL_RANGE
Amplitude display units	840-843	AMPL
EMF-Volts amplitude display mode	850,851	AMPL_EMFOUT
MODULATION		
Modulation oscillator output	40,41	MODOUT
Modulation frequency to 0.1 Hz	42	MODF
Low-rate FM	710,711	LORATEFM
High-rate ØM	720,721	HIRATEPM
Low-distortion/fixed-range FM	730-732	FM_RANGE
Internal pulse modulation	740,741	INT_PULSE
Modulation oscillator waveform	750-752,758	MOD_WAVE
Enter pulse width	759	PULSE_WIDTH
SWEEP		
Sweep dwell time	890-899	SWEEP_DWELL
Sweep symmetry	880,881	SWEEP_SYM
Initiate single sweep	882	SWEEP_SINGLE
MEMORY		
Reset memory locations	801	MEM_RESET
Display/Set mem. seq. dividers	802	MEM_DIVIDER
Write-protect memory locations	810,811	MEM_LOCK
Erase nonvolatile memory	829	MEM_ERASE
REMOTE		
Display/Set IEEE-488 address	10	n/a
Display/Set IEEE-488 addr. mode	11	n/a
Display/Set IEEE-488 language	12	GAL
Display/Enter service request mask	13	*SRE
Set user request SRQ	14	n/a
Clear SRQ	15	n/a
MISCELLANEOUS		
Clear special functions	00	SPCL 00
Restore instrument preset state	01	SPCL 01
Initiate power-on self tests	02	*TST?
Display self test results	03	STATUS
Display option loading status	08	*OPT?
Display software revision level	09	*IDN?
Disable display	770,771	DISPLAY
Frequency blanking	780, 781	FREQ_BLANK
Enable secure mode	820, 821	SECURITY
Step key repeat rate	860-862	KEY_RATE
Knob and step key operation	870-873	KNOB_STEP

Contents

SYNTAX RULES	1
COMMAND SUMMARY BY FUNCTION	3
COMMANDS	9
TALK ONLY/LISTEN ONLY OPERATION	29
STATUS REGISTER SUMMARY	31

SYNTAX RULES

MULTIPLE PARAMETERS	When a command has more than one parameter, the parameters must be separated by commas. For example, "MEM_DIVIDER 1, 25, 30, 48".
NUMERIC PARAMETERS	These may have up to 255 significant digits with exponents ranging from -32000 to +32000. The useful range for signal generator programming is +/- 2.2 E-308 to +/- 1.8 E308
EXTRA PARAMETERS	If more (or too few) parameters are specified than allowed by a particular command, a command error occurs.
NULL PARAMETERS	Null parameters cause a command error (e.g., the adjacent commas in "MEM_DIVIDER 1, 25, , 48").
EXPRESSIONS	Expressions, for example "(4+2*13)", are not allowed as parameters.
TERMINATORS	The signal generator sends the ASCII character Line Feed (LF) with the EOI control line asserted as the terminator for response messages. The signal generator recognizes the following as terminators when encountered in incoming data: • The ASCII LF character • Any ASCII character sent with the EOI control line asserted • The terminator used by the Fluke 1722A Instrument Controller for data sent to instruments on the IEEE-488 bus is programmable, but its default is LF with EOI.

SYNTAX RULES (cont)

RESPONSE MESSAGE SYNTAX	Integers for most controllers or computers are decimal numbers in the range -32768 to 32767. In the "Commands" table, responses from the signal generator are described wherever appropriate. In order to know whether to read an integer or a floating-point number, the first entry is ("Integer) or "(Floating)".
MULTIPLE COMMANDS	If the controller on the IEEE-488 bus is a Fluke 1722A, commands are sent one at a time, or combined in Fluke BASIC PRINT statements. A semi-colon separates multiple commands on one line.
COMMAND PROCESSING	All commands are processed in the order they are received. Each command is completely processed before the next is processed.
COMMAND RESTRICTIONS	During sweep operation, some commands are rejected and some are processed differently. In local, all calibration and compensation commands are rejected. During calibration and compensation procedures, only a subset of commands are allowed.

COMMAND SUMMARY BY FUNCTION

RF OUTPUT FREQUENCY

EXTREF_FREQ	Selects the external reference frequency
EXTREF_FREQ?	Retrieves the selected external reference frequency
FREQ	Programs the displayed RF frequency
FREQ?	Retrieves the displayed RF frequency
FREQ_ABS?	Retrieves the RF output frequency
FREQ_BASE?	Retrieves the base frequency
FREQ_BLANK	Selects RF output blank mode
FREQ_BLANK?	Retreives the state of RF output blanking mode
FREQ_REL	Selects relative frequency mode
FREQ_REL?	Retrieves the state of relative frequency mode
LOWNOISE	Selects low-noise external reference mode
LOWNOISE?	Retreives the state of low-noise ext ref mode
REF?	Retrieves the state of the frequency reference (INT/EXT) selection

PHASE ADJUST

PHASE	Adjusts the phase of the carrier
PHASE?	Retrieves the relative phase adjustment
PHASE_CLK	Programs measured phase adjustment clock freq
PHASE_CLK?	Retrieves the phase adjustment clock frequency
PHASE_ZERO	Zeros the relative phase adjustment

RF OUTPUT AMPLITUDE

AMPL	Retrieves the displayed RF amplitude
AMPL?	Programs the displayed RF amplitude
AMPL_ABS?	Retrieves the RF output level
AMPL_BASE?	Retrieves the base amplitude
AMPL_CMPDAT	Selects alternate output level compensation data
AMPL_CMPDAT?	Retrieves alternate output level comp state
AMPL_COMP	Selects amplitude compensation mode
AMPL_COMP?	Retrieves the state of amplitude comp mode
AMPL_EMFOUT	Selects EMF display mode
AMPL_EMFOUT?	Retrieves the state of EMF display mode
AMPL_RANGE	Selects amplitude normal/fixed range mode
AMPL_RANGE?	Retrieves the state of amplitude range mode
AMPL_REL	Selects relative amplitude mode
AMPL_REL?	Retrieves the state of relative amplitude mode
AMPL_UNITS	Converts the AMPLITUDE display to specified units
RFOUT	Turns RF OUTPUT port ON or OFF
RFOUT?	Retrieves the state of the RF OUTPUT port

COMMAND SUMMARY BY FUNCTION (cont)

AM MODULATION

AM	Programs the AM depth
AM?	Retrieves the AM depth
EXTAC_AM	Turns external AM (ac coupled) ON or OFF
EXTAC_AM?	Retrieve the state of external AM (ac coupled)
EXTDC_AM	Turns external AM (dc coupled) ON or OFF
EXTDC_AM?	Retrieves the state of external AM (dc coupled)
INT_AM	Turns internal AM ON or OFF
INT_AM?	Retrieves the state of internal AM

FM or ØM MODULATION

EXTAC_FM	Turns external FM/ØM (ac coupled) ON or OFF
EXTAC_FM?	Retrieves the state of external FM/ØM (ac coupled)
EXTDC_FM	Turns external FM/ØM (dc coupled) ON or OFF
EXTDC_FM?	Retrieves the state of external FM/ØM (dc coupled)
FM	Programs the FM/ØM deviation
FM?	Retrieves the FM/ØM deviation
FM_RANGE	Selects normal/low distortion/fixed range FM
FM_RANGE?	Retrieves the state of low distortion/fixed range FM
FM_UNITS	Converts the FM display to specified units
HIRATEPM	Turns high rate ØM mode ON or OFF
HIRATEPM?	Retrieves the state of high rate ØM mode
INT_FM	Turns internal FM/ØM ON or OFF
INT_FM?	Retrieves the state of internal FM/ØM
LORATEFM	Turns low rate FM mode ON or OFF
LORATEFM?	Retrieves the state of low rate FM mode

PULSE MODULATION

EXT_PULSE	Turns external pulse modulation ON or OFF
EXT_PULSE?	Retrieves the state of external pulse modulation
INT_PULSE	Tuns internal pulse modulation ON or OFF
INT_PULSE?	Retrieves the state of internal pulse modulation

INTERNAL MODULATION OSCILLATOR

MOD_WAVE	Selects the modulation oscillator waveform
MOD_WAVE?	Retrieves the modulation oscillator waveform
MODF	Programs the modulation frequency
MODF?	Retrieves the modulation frequency
MODL	Programs the modulation level
MODL?	Retrieves the modulation level
MODOUT	Selects the default state of the MOD OUTPUT port

COMMAND SUMMARY BY FUNCTION (cont)

MODOUT?	Retrieves the fault state of the MOD OUTPUT port
PULSE_WIDTH	Programs the modulation oscillator pulse width
PULSE_WIDTH?	Retrieves the modulation oscillator pulse width

SWEEP

AMPL_MANUAL	Increments or decrements manual amplitude sweep
AMPL_SINCR	Programs the amplitude sweep increment
AMPL_SINCR?	Retrieves the amplitude sweep increment
AMPL_SWIDTH	Programs the amplitude sweep width
AMPL_SWIDTH?	Retrieves the amplitude sweep width
FREQ_MANUAL	Increments or decrements manual frequency sweep
FREQ_SINCR	Programs the frequency sweep increment
FREQ_SINCR?	Retrieves the frequency sweep increment
FREQ_SWIDTH	Programs the frequency sweep width
FREQ_SWIDTH?	Retrieves the frequency sweep width
SWEEP	Selects the sweep mode
SWEEP?	Retrieves the sweep mode
SWEEP_DWELL	Programs the sweep dwell time
SWEEP_DWELL?	Retrieves the sweep dwell time
SWEEP_FIELD	Selects the sweep field
SWEEP_FIELD?	Retrieves the sweep field
SWEEP_SYM	Selects the sweep symmetry
SWEEP_SYM?	Retrieves the sweep symmetry

MISCELLANEOUS

*DDT	Defines device trigger buffer
*DDT?	Queries device trigger buffer
DISPLAY	Selects the display status
DISPLAY?	Retrieves the display status
GAL	Goes to alternate language for emulation
KEY_RATE	Selects the repeat rate for the step keys
KEY_RATE?	Retrieves the key repeat rate
KNOB_STEP	Selects operation of knob and step up/down keys
KNOB_STEP?	Retrieves state of knob and step up/down keys
LOCALERT	Sets mode to generate an SRQ on complete front panel operations
LOCALERT?	Retrieves state of local alert (LOCALERT) mode
MOD_DISPLAY	Selects quantity to be shown in modulation field
MOD_DISPLAY?	Retrieves quantity shown in modulation field
*OPC	Sets bit 0 in the ESR when pending remote operations are complete
*OPC?	Replies with "1" when all pending operations complete
*OPT?	Retrieves report of installed options
PRESET	Resets instrument to the preset state
*PUD	Defines protected user data buffer
*PUD?	Retrieves protected user data buffer

SECURITY	Turns secure mode on or off
SECURITY?	Retreives the state of secure mode
SPCL	Selects a special function by number
*RST	Resets instrument to default memory location
*TRG	Triggers device
*WAI	Waits until all pending remote operations complete

MEMORY

MEM_DIVIDER	Programs memory divider locations
MEM_DIVIDER?	Retrieves memory divider locations
MEM_ERASE	Erases and initializes nonvolatile memory
MEM_LOCK	Selects lock protection for memory store
MEM_LOCK?	Retrieves the state of memory lock protection
MEM_RESET	Resets all memory locations to instrument default
*RCL	Recalls a memory location
*SAV	Saves to a memory location
SEQ	Recalls the next or previous memory location

STEP

AM_STEP	Programs the AM depth step size
AM_STEP?	Retrieves the AM depth step size
AMPL_STEP	Programs the output amplitude step size
AMPL_STEP?	Retrieves the output amplitude step size
FM_STEP	Programs the FM/ØM deviation step size
FM_STEP?	Retrieves the FM/ØM deviation step size
FREQ_STEP	Programs the output frequency step size
FREQ_STEP?	Retrieves the output frequency step size
MODF_STEP	Programs the modulation frequency step size
MODF_STEP?	Retrieves the modulation frequency step size
MODL_STEP	Programs the modulation level step size
MODL_STEP?	Retrieves the modulation level step size
SD	Steps the active step field down by one step size
STEP_AM	Steps the AM depth up or down by one step size
STEP_AMPL	Steps output amplitude up or down one step size
STEP_FIELD	Selects step field
STEP_FIELD?	Retrieves step field
STEP_FM	Steps FM/ØM deviation up or down one step size
STEP_FREQ	Steps output frequency up or down one step size
STEP_MODF	Steps modulation frequency up or down one step size
STEP_MODL	Steps modulation level up or down one step size
SU	Steps active step field up one step size

COMMAND SUMMARY BY FUNCTION (cont)

EDIT

AM_BRT	Moves bright digit to specified decade in AM field
AM_BRT?	Retrieves decade of AM bright-digit position
AMPL_BRT	Moves bright digit to specified decade in amplitude field
AMPL_BRT?	Retrieves decade of amplitude bright-digit position
BRT_FIELD	Selects bright-digit field
BRT_FIELD?	Retrieves current bright-digit field
EDIT_AM	Selects AM bright-digit field and edits AM
EDIT_AMPL	Selects amplitude bright-digit field and edits amplitude
EDIT_FM	Selects FM/ØM bright-digit field and edits FM/ØM
EDIT_FREQ	Selects frequency bright-digit field and edits frequency
EDIT_MODF	Selects modulation freq bright-digit field and edits modulation freq
EDIT_MODL	Selects modulation level bright-digit field and edits modulation level
FM_BRT	Moves bright digit to specified decade in FM/ØM field
FM_BRT?	Retrieves decade of FM/ØM bright-digit position
FREQ_BRT	Moves bright digit to specified decade in frequency field
FREQ_BRT?	Retrieves decade of frequency bright-digit position
MODF_BRT	Moves bright digit to specified decade in modulation freq field
MODF_BRT?	Retrieves decade of modulation frequency bright-digit position
MODL_BRT	Moves bright digit to specified decade in modulation level field
MODL_BRT?	Retrieves decade of modulation level bright-digit position

STATUS/ERROR

*CLS	Clears status
ERROR?	Retrieves an error code from the error queue
*ESE	Programs Event Status Enable register
*ESE?	Retrieves Event Status Enable register
*ESR?	Retrieves and clears the Event Status Register
EXPLAIN?	Explains a status/error code
*IDN?	Retrieves instrument identification
ISCE	Programs Instrument Status Change Enable register
ISCE?	Retrieves Instrument Status Change Enable register

COMMAND SUMMARY BY FUNCTION (cont)

ISCR?	Retrieves and clears Instrument Status Change Register
ISR?	Retrieves and clears Instrument Status Register
*SRE	Programs Service Request Enable register
*SRE?	Retrieves Service Request Enable register
STATUS	Loads specified status into the status queue
STATUS?	Retrieves a status code from the status queue
*STB?	Retrieves the status byte

SERVICE

ATT_LOG?	Retrieves the attenuator log
CAL_AM	Initiates AM calibration procedure
CAL_FM	Initiates FM calibration procedure
CAL_LEVEL	Initiates level calibration procedure
CAL_REFOSC	Initiates reference oscillator calibration procedure
CC_BRKFREQ?	Returns attenuator comp procedure break freq
CC_ERRFREQ?	Returns frequency where automatic compensation procedure failed
CC_EXIT	Exits calibration/compensation procedure
CC_FREQ?	Retrieves the RF output frequency during calibration/compensation procedure
CC_RDAM	Reports measured AM depth to calibration procedure
CC_RDDVM	Reports measured voltage to comp procedure
CC_RDFM	Reports measured FM deviation to calibration procedure
CC_RDFREQ	Reports measured RF frequency to calibration procedure
CC_RDPOWER	Reports measured power to cal/comp procedure
CC_RESUME	Resumes attenuator compensation procedure
CC_SAVE	Calculates corrections, saves new data in cal/comp memory
CC_TARGET?	Returns target value of compensation procedure
CMEM_CLRALT	Clears attenuate output compensation data
CMEM_FIX	Repairs compensation memory checksum errors
COMP_ATT	Initiates attenuator compensation procedure
COMP_ATTPMTR	Initiates attenuator compensation procedure with power meter
COMP_COARSE	Initiates automatic coarse loop comp procedure
COMP_OUT	Initiates output compensation procedure
COMP_OUTDEF	Initiates output compensation procedure with default attenuator data
COMP_SUBSYN	Initiates subsynthesizer compensation procedure
COMP_SUM	Initiates automatic sum loop comp procedure
ETIME?	Retrieves the elapsed time
TEST_ATT	Programs alternate attenuator settings
TEST_DISP	Executes display test
*TST?	Executes self-test

COMMANDS

COMMAND	PARAMETERS	RESPONSE
AM	AM depth with optional PCT or % units.	None
AM?	None	1. (Float) AM depth 2. (String) PCT
AM_BRT	Bright-digit decade in AM display with optional PCT or % units.	None
AM_BRT?	None	1. (Float) Bright-digit decade in AM display 2. (String) PCT
AM_STEP	AM depth step size with optional PCT or % units	None
AM_STEP?	None	1. (Float) AM depth step size 2. (String) PCT
AMPL	Displayed RF amplitude with optional power, voltage, or dB units.	None
AMPL?	None	1. (Float) Displayed RF amplitude 2. (String) DBM, DBUV, DBMV, DBF, DB, V, DBUV-EMF,dBMV-EMF, or V-EMF
AMPL_ABS?	None	1. (Float) RF output amplitude 2. (String) DBM,dBUV,dBV,dBMV,dBF,V,dBUV-EMF,dBMV-EMF,or V-EMF

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
AMPL_BASE	None	1. (Float) Base RF amplitude. 2. (String) DB, V, V-EMF
AMPL_BRT	Bright-digit decade in AMPLITUDE display field with optional power, voltage, or dB units.	None
AMPL_BRT?	None	1. (Float) Bright-digit decade in AMPLITUDE display field. 2. (String) DBM, DBUV, DBMV, DB, or V
AMPL _CMPDAT	STD or ALT	None
AMPL _CMPDAT?	None	(String) STD or ALT
AMPL_COMP	ALL, OUTPUT or NONE	None
AMPL_COMP?	None	(String) ALL, OUTPUT or NONE
AMPL_EMFOUT	ON or OFF or 1 or 0	None
AMPL_ EMFOUT?	None	(String) ON or OFF
AMPL_MANUAL	Number of counts to increment or decrement the active manual amplitude sweep.	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
AMPL_RANGE	NORMAL or FIXED	None
AMPL_RANGE	None	(String) NORMAL or FIXED
AMPL_REL	ON or OFF or 1 or 0	None
AMPL_REL?	None	(String) ON or OFF
AMPL_SINCR	Increment with optional dB units or voltage units.	None
AMPL_SINCR?	None	1. (Float) Amplitude sweep increment. 2. (String) DB, V, or V-EMF
AMPL_STEP	Amplitude step size with optional dB units or voltage units.	None
AMPL_STEP?	None	1. (Float) Amplitude step size. 2. (String) DB, V, or V-EMF
AMPL_SWIDTH	Sweep width with optional dB units or voltage units	None
AMPL_SWIDTH?	None	1. (Float) Amplitude sweep width. 2. (String) DB, V, or V-EMF
AMPL_UNITS	dBM or V	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
ATT_LOG?	None	1. (Integer) A6 attenuator count. 2. (Integer) A12 attenuator count. 3. (Integer) A24A attenuator count. 4. (Integer) A24B attenuator count. 5. (Integer) A24C attenuator count. 6. (Integer) A24D attenuator count. 7. (Integer) A24E attenuator count.
BRT_FIELD	AM , AMPL, FM, FREQ, MODF, or MODL	None
BRT_FIELD?	None	(String) AM, AMPL, FM, FREQ, MODF or MODL
CAL_AM	None	None
CAL_FM	None	None
CAL_LEVEL	None	None
CAL_REFOSC	None	None
CC_BRKFREQ?	None	1. (Float) Frequency 2. (String) HZ
CC_ERRFREQ?	None	1. (Integer) Error Code 2. (Float) Frequency 3. (String) HZ
CC_EXIT	None	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
CC_FREQ?	None	1. (Float) Output frequency. 2. (String) HZ
CC_HETADJ?	None	1. (Float) Frequency 2. (String) Hz 3. (Float) Level Adjustment 4. (String) DB
CC_RDAM	AM depth with optional PCT or % units.	None
CC_RDDVM	Voltage with optional voltage units	None
CC_RDFM	FM deviation with optional frequency units.	None
CC_RDFREQ	Frequency with optional frequency units.	None
CC_RDPOWER	Output power with optional dBM units.	None
CC_RESUME	None	None
CC_SAVE	None	None
CC_TARGET?	None	1. (Float): Target value. 2. (String) PCT, HZ, DBM, or V
*CLS	None	None
CMEM_CLRALT	None	None
CMEM_FIX	None	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
COMP_ATT	None	None
COMP_ATTPMTR	None	None
COMP _COARSE	None	None
COMP_OUT	None	None
COMP_OUTDEF	None	None
COMP _SUBSYN	None	None
COMP_SUM	None	None
*DDT	#0 <user data><ASCII Line Feed with EOI> or #<non-zero digit><digits><user data> For both forms, the bytes received in the <user data> field are stored in nonvolatile memory and up to 72 bytes are allowed. The first form accepts data bytes after the #0 until the ASCII Line Feed character is received with an EOI signal. In the second form, the non-zero digit specifies the number of characters that will follow in the <digits> field. These characters must be 0 through 9 (ASCII 48 through 57 decimal). The	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
*DDT(cont.)	value of the number in the <digits> field defines the number of user data bytes that will follow in the <user data> field.	
*DDT?	None	#(non-zero digit)(digits)(user data) The non-zero digit specifies the number of characters that will follow in the <digits> field. These characters are 0 through 9 (ASCII 48 through 57 decimal). The value of the number in the <digits> field defines the number of user data bytes that follow in the <user data> field. The maximum response is 72 characters.
DISPLAY	On or OFF or 1 or 0	None
DISPLAY?	None	(String) ON or OFF
EDIT_AM	Number of counts by which bright digit is edited	None
EDIT_AMPL	Number of counts by which bright digit is edited.	None
EDIT_FM	Number of counts by which bright digit is edited.	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
EDIT_FREQ	Number of counts by which bright digit is edited.	None
EDIT_MODF	Number of counts by which bright digit is edited.	None
EDIT_MODL	Number of counts by which bright digit is edited	None
ERROR?	(optional) EXPLAIN	1. (Integer) The error code. 2. (optional) (String) The explanation of the code.
*ESE	The decimal equivalent of the binary number to load into the register (0-255 only).	None
*ESE?	None	(Integer) Decimal equivalent of the register byte.
*ESR?	None	(Integer) Decimal equivalent of the register byte.
ETIME?	None	1. (Float) Total number of hours the instrument has been operating. 2. (String) HRS
EXPLAIN?	The error/status code to explain.	(String) The explanation of the code.
EXT_PULSE	ON or OFF or 1 or 0	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
EXT_PULSE?	None	(String) ON or OFF
EXTAC_AM	ON or OFF or 1 or 0	None
EXTAC_AM?	None	(String) ON or OFF
EXTAC_FM	ON or OFF or 1 or 0	None
EXTAC_FM?	None	(String) ON or OFF
EXTDC_AM	ON or OFF or 1 or 0	None
EXTDC_AM?	None	(String) ON or OFF
EXTDC_FM	ON or OFF or 1 or 0	None
EXTDC_FM?	None	(String) ON or OFF
EXTREF_FREQ	STD (10 MHz) ALT	None
EXTREF _FREQ?	None	(String) STD or ALT
FM	FM/ØM deviation with optional frequency or radians units.	None
FM?	None	1. (Float) FM/ØM deviation. 2. (String) HZ or RAD

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
FM_BRT	Bright-digit decade in FM/ØM display field with optional frequency or radians units.	None
FM_BRT?	None	1. (Float) Bright-digit decade in FM/ØM display. 2. (String) HZ or RAD
FM_RANGE	NORMAL, LOWDISTORT, or FIXED	None
FM_RANGE?	None	(String) NORMAL LOWDISTORT, or FIXED
FM_STEP	FM/ØM deviation step size with optional frequency or radians units	None
FM_STEP?	None	1. (Float) FM deviation step size 2. (String) HZ or RAD
FM_UNITS	HZ or RAD	None
FREQ	Frequency with frequency units.	None
FREQ?	None	1. (Float) Displayed RF frequency. 2. (String) HZ
FREQ_ABS?	None	1. (Float) Output RF frequency. 2. (String) HZ

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
FREQ_BASE?	None	1. (Float) Base RF frequency. 2. (String) HZ
FREQ_BLANK	ON or OFF or 1 or 0	None
FREQ_BLANK?	None	(String) ON or OFF
FREQ_BRT	Bright-digit decade in FREQUENCY display field with optional frequency units.	None
FREQ_BRT?	None	1. (Float) Bright-digit decade in FREQUENCY display. 2. (String) HZ
FREQ_MANUAL	Number of counts to increment or decrement the active manual frequency sweep	None
FREQ_REL	ON or OFF or 1 or 0	None
FREQ_REL?	None	(String) ON or OFF
FREQ_SINCR	Sweep increment with optional frequency units.	None
FREQ_SINCR?	None	1. (Float) Frequency sweep increment. 2. (String) HZ
FREQ_STEP	Frequency step size with optional frequency units.	None
FREQ_STEP?	None	1. (Float) Frequency step size. 2. (String) HZ

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
FREQ_SWIDTH	Sweep width with optional frequency units.	None
FREQ _SWIDTH?	None	1. (Float) Frequency sweep width. 2. (String) HZ
GAL	Optional L6080 , L6070 , L6060, or L8642	None
HIRATEPM	ON or OFF or 1 or 0	None
HIRATEPM?	None	(String) ON or OFF
*IDN?	None	1. (String) FLUKE 2. (String) Model 3. (String) Serial Number 4. (String) Firmware Rev.
INT_AM	ON or OFF or 1 or 0	None
INT_AM?	None	(String) ON or OFF
INT_FM	ON or OFF or 1 or 0	None
INT_FM?	None	(String) ON or OFF
INT_PULSE	ON or OFF or 1 or 0	None
INT_PULSE?	None	(String) ON or OFF
ISCE	The decimal equivalent of the binary number to load into the register.	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
ISCE?	None	The decimal equivalent of the register contents byte
ISCR?	None	The decimal equivalent of the register contents byte
ISR?	None	The decimal equivalent of the register contents byte
KEY_RATE	SLOW, MEDIUM, or FAST	None
KEY_RATE?	None	(String) SLOW, MEDIUM or FAST
KNOB_STEP	1. ON or OFF (Turns the knob on or off) 2. STEP or EDIT (Configures the step keys)	None
KNOB_STEP?	None	1. (String) ON or OFF 2. (String) STEP or EDIT
LOCALERT	ON or OFF or 1 or 0	None
LOCALERT?	None	(String) ON or OFF
LORATEFM	ON or OFF or 1 or 0	None
LORATEFM?	None	(String) ON or OFF
LOWNOISE	ON or OFF or 1 or 0	None
LOWNOISE?	None	(String) ON or OFF

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
MEM_DIVIDER	1. Memory divider 1 location number 2. Memory divider 2 location number 3. Memory divider 3 location number 4. Memory divider 4 location number	None
MEM_DIVIDER?	None	1. (Integer) Memory divider 1 location number 2. (Integer) Memory divider 2 location number 3. (Integer) Memory divider 3 location number 4. (Integer) Memory divider 4 location number
MEM_ERASE	None	None
MEM_LOCK	ON or OFF or 1 or 0	None
MEM_LOCK?	None	(String) ON or OFF
MEM_RESET	None	None
MOD_DISPLAY	AM, FM, or MODF, or MODL	None
MOD_DISPLAY?	None	(String) AM, FM, MODF, or MODL
MOD_WAVE	SINE, TRIANGLE, SQUARE, PULSE	None
MOD_WAVE?	None	(String) SINE, TRIANGLE, SQUARE, PULSE

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
MODF	Modulation frequency with optional frequency units.	None
MODF?	None	1. (Float) Modulation frequency. 2. (String) HZ
MODF_BRT	Bright-digit decade in modulation frequency display field with optional frequency units.	None
MODF_BRT?	None	1. (Float) Bright-digit decade in modulation frequency display. 2. (String) HZ
MODF_STEP	Modulation frequency step size with optional frequency units	None
MODF_STEP?	None	1. (Float) Modulation frequency step size. 2. (String) HZ
MODL	Modulation level with optional voltage units	None
MODL?	None	1. (Float) Modulation level. 2. (String) V
MODL_BRT	Bright-digit decade in modulation level display field with optional voltage units.	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
MODL_BRT?	None	1. (Float) Bright-digit decade in modulation level display. 2. (String) V
MODL_STEP	Modulation level step with optional voltage units.	None
MODL_STEP?	None	1. (Float) Modulation level step size. 2. (String) V
MODOUT	ON or 1 or 0 (modulation output always at MODOUT connector.) OFF or 1 or 0 (modulation output off.)	None
MODOUT?	None	(String) ON or OFF
*OPC	None	None
*OPC?	None	(Integer) "1" after all operations are complete.
*OPT?	None	(Series of strings) A comma-separated list of the option names. Each option name includes the option number and a description. If the option is not installed, a zero is returned instead of the string.
PHASE	(Float) Phase adjustment wiht optional degree units.	None
PHASE?	None	1. (Float) Relative phase adjustment 2. (String) DEG

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
PHASE_CLK	1. (Float) Clock frequency 2. (String) HZ	
PHASE_CLK?	None	1. (Float) Clock frequency 2. (String) HZ
PHASE_ZERO	None	None
PRESET	None	None
*PUD	#0 <user data><ASCII Line Feed with EOI> or #<non-zero digit><digits><user data> For both forms, the bytes received in the <user data> field are stored in nonvolatile memory and up to 72 bytes are allowed. The first form accepts data bytes after the #0 until the ASCII Line Feed character is received with an EOI signal. In the second form, the non-zero digit specifies the number of characters that will follow in the <digits> field. These characters must be 0 through 9 (ASCII 48 through 57 decimal). The value of the number in the <digits> field defines the number of user data bytes that will follow in the <user data> field.through 57 decimal). The value of the number in the <digits> field defines the number of user data bytes that follow in the <user data> field. The maximum response is 64 characters.	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
*PUD?	None	#(non-zero digit)(digits)(user data) The non-zero digit specifies the number of characters that will follow in the <digits> field. These characters are 0 through 9 (ASCII 48 through 57 decimal). The value of the number in the <digits> field defines the number of user data bytes that follow in the <user data> field. The maximum response is 72 characters.
PULSE_WIDTH	Pulse width with optional seconds units.	None
PULSE_WIDTH?	None	1. (Float) Pulse width 2. (String) S
*RCL	Memory location.	None
REF?	None	(String) INT or EXT
RFOUT	ON or OFF or 1 or 0	None
RFOUT?	None	(String) ON or OFF
*RST	None	None
*SAV	Memory location	None
SD	None	None
SECURITY	ON or OFF or 1 or 0	None
SECURITY?	None	(String) ON or OFF
SEQ	UP or DOWN	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
SPCL	Special function number	None
*SRE	The decimal equivalent of the binary number to load into the register	None
*SRE?	None	(Integer) The decimal equivalent of the register byte
STATUS	UNCAL, SELFTEST, CHECKSUM, or ORIGIN	None
STATUS?	(Optional) EXPLAIN	1. (Integer) Currently loaded uncal, self-test, memory status code, or a zero. 2. (optional) (String) The explanation of the code
*STB?	None	(Integer) Decimal equivalent of the status byte
STEP_AM	UP or DOWN	None
STEP_AMPL	UP or DOWN	None
STEP_FIELD	AM, AMPL, FM, FREQ, MODF or MODL	None
STEP_FIELD?	None	(String) AM, AMPL, FM, FREQ, MODF, or MODL
STEP_FM	UP or DOWN	None
STEP_FREQ	UP or DOWN	None
STEP_MODF	UP or DOWN	None
STEP_MODL	UP or DOWN	None

COMMANDS (cont)

COMMAND	PARAMETERS	RESPONSE
SU	None	None
SWEEP	OFF, AUTO, MANUAL, or SINGLE	None
SWEEP?	None	(String) OFF, AUTO, MANUAL, or SINGLE
SWEEP_DWELL	Dwell time with optional seconds units.	None
SWEEP_DWELL?	None	1. (Integer) Dwell time. 2. (String) S
SWEEP_FIELD	FREQ (Frequency) AMPL (Amplitude)	None
SWEEP_FIELD?	None	(String) FREQ or AMPL
SWEEP_SYM	ASYM (Asymmetrical) SYMM (Symmetrical)	None
SWEEP_SYM?	None	(String) ASYM or SYMM
TEST_ATT	A24B, A24C, A24D, or A24E	None
TEST_DISP	None	None
*TRG	None	None
*TST	None	(Integer) 0 (for Pass) or 1 (for Fail)
*WAI	None	None

TALK ONLY/LISTEN ONLY OPERATION

INTRODUCTION

The signal generator can be used with any IEEE-488 controller in the normal addressed mode. The listen-only and talk-only modes are available for operation without a controller. In listen-only mode, the signal generator responds to all data messages on the IEEE-488 bus. In talk-only mode, the signal generator sends commands on the IEEE-488 bus to program another signal generator.

TALK-ONLY OPERATION

In talk-only, the signal generator outputs the step up (";SU") and step down (";SD") commands whenever the front panel step up and down entries are made. Two signal generators can be set up to track in frequency with an offset by connecting one signal generator in talk-only to another signal generator in listen-only. To do this, follow these steps:

1. Program the two signal generators to the desired frequencies

2. Program the frequency step value to be the same on both generators;

3. Press the step up or step down keys on the generator that is in talk-only mode.

Note that if the step sizes are different or if the functions selected to step are different, the signal generators will no longer track with the same offset.

Any of the six functions may be stepped (frequency, amplitude, AM depth, FM deviation, modulation frequency, and modulation level)

The step function of the talker need not match that of the listener.

A Fluke 6060A, 6060B, 6061A, or 6062A may also be used as the listener with the limitation that they cannot step modulation frequency or modulation level.

A Fluke 6070A or 6071A may be used as the listener with the limitation that it will always step frequency.

The signal generator implements the talk-only (ton) function described in the IEEE-488.1 standard. The IEEE-488.2 standard does not cover talk-only operation. The talk-only mode is selected by the talker/listener special function.

When the mode is changed, the IEEE-488 interface chip is reset, and any current IEEE-488 bus activity is discarded.

In talk-only, the signal generator is always in local, and is always addressed as a talker. The ADDR annunciator is always lit.

In talk-only, the device clear, trigger, and serial poll messages are ignored.

LISTEN-ONLY OPERATION

A Fluke 6060A, 6060B, 6061A, or 6062A may be used as a talk-only instrument with a 6080A/82A as the listener. They output ",SU" and ",SD" which causes a command error for the 6080 language. Therefore, if the 6080A/82A is to be the listener, it should be configured to one of the compatibility languages.

The signal generator implements the listen-only (lon) function described in the IEEE-488.1 standard. The IEEE-488.2 standard does not cover listen-only operation. The listen-only mode is selected by the talker/listener special function.

When the mode is changed, the IEEE-488 interface chip is reset, and any current IEEE-488 bus activity is discarded.

In listen-only, the signal generator is always in local, and is always addressed as a listener. The ADDR annunciator is always lit.

In listen-only, the signal generator responds to all commands allowed,with the exception of queries and calibration/compensation commands.

These commands are processed with no errors, but nothing is sent over the bus. In listen-only mode, device clear, trigger, and serial poll messages are ignored.

STATUS REGISTER SUMMARY

CHECKING THE INSTRUMENT STATUS

The programmer has access to status registers, enable registers, and queues in the signal generator to indicate various conditions as shown on page 39.

Some of the registers and queues are defined by the IEEE-488.2 standard. The rest are specific to the signal generator.

Each status register and queue has a summary bit in the Serial Poll Status Byte.

Enable registers are used to mask various bits in the status registers and generate summary bits in the Serial Poll Status Byte.

The Service Request Enable Register can be used to assert the IEEE-488 Service Request (SRQ) control line on any one of the status conditions in the instrument. Queries cause the signal generator response to be placed in the output queue.

The output queue may contain responses from more than one query. The responses are:

- output on a first-in/first-out basis
- one at a time
- in response to a controller input program statement.

If the output queue is empty, no response is sent to the controller

For the following bit-assignment tables, the register names are abbreviated as follows:

STB	Status Byte Register
SRE	Status Register Enable Register
ESR	Event Status Register
ESE	Event Status Enable Register
ISR	Instrument Status Register
ISCR	Instrument Status Change Register
ISCE	Instrument Status Change Enable Register

STATUS REGISTER SUMMARY (cont)

BIT ASSIGNMENTS FOR STB AND SRE

7	6	5	4
ALWAYS 0	RQS MSS	ESB	MAV
3	2	1	0
EAV	ISCB	SAV	ALWAYS 0

RQS Requesting service. The RQS bit is set to 1 whenever bit ESB, MAV, EAV, ISCB, or SAV changes from 0 to 1 and are enabled (1) in the SRE. When RQS is 1, the signal generator asserts the SRQ control line on the IEEE-488 interface. A serial poll to read this bit will determine if the signal generator is the source of an SRQ.

MSS Master summary status. Set to 1 whenever bit ESB, MAV, EAV, ISCB, or SAV is 1 and enabled (1) in the SRE. This bit can be read using the *STB? command.

ESB Is set to 1 when one or more enabled ESR bits are 1.

MAV Message available. The MAV bit is set to 1 whenever data is available in the signal generator's IEEE-488 interface output buffer.

EAV Error available. An error has occurred and an error code is available to be read from the error queue using the ERROR? query.

ISCB One or more enabled ISCR bits are 1.

SAV Status available. Status codes have been loaded into the status queue and are available to be read from the queue using the STATUS? query.

STATUS REGISTER SUMMARY (cont)

BIT ASSIGNMENTS FOR ESR AND ESE

7	6	5	4
PON	URQ	CME	EXE
3	2	1	0
DDE	QYE	ALWAYS 0	OPC

PON Power-on. This bit is set to 1 if the power supply has been turned off and on since the last time the ESR was read.

URQ User request. This bit is set on special function 14.

CME Command error. The signal generator's IEEE-488 interface encountered an incorrectly formed command. (The command ERROR? fetches the earliest error code in the error queue, which contains error codes for the first 15 errors that have occurred)

BIT ASSIGNMENTS FOR ESR AND ESE (cont)

EXE Execution error. An error occured while the signal generator tried to execute the last command. This could be caused, for example, by a parameter being out of its allowed range or inconsistent with the generator's capabilities. An example is an attempt to execute "FREQ 100 GHZ", which is outside the range of the signal generator. (The command ERROR? fetches the earliest error in the error queue, which contains error codes for the first 15 errors that occurred.)

DDE Device-dependent error. An error occurred which is not a Command Error (CME), a Query Error (QYE), or an Execution Error (EXE). If a DDE occurs as the result of executing a command, it means that the command was formed properly and contains valid parameters, but some error condition arose during execution that prevented the command from completing properly. An example of a Device Dependent Error is error 90, "CALICOMP switch not set to I (on)", which can occur when a calibration or compensation procedure is requested. (The command ERROR? fetches the earliest error in the error queue, which contains error codes for the first 15 errors that have occurred.)

QYE Query error. The signal generator was addressed to talk when no response data is present in the output queue and the instrument is not generating any response data via execution of a query. When a query error occurs, the signal generator clears the output queue, sets the QYE bit in the ESR register, and logs one of the three following error codes into the error queue according to the type of query error encountered:

Error 78: IEEE-488.2 UNTERMINATED Command

The unterminated command query error occurs when the controller attempts to read data from the signal generator's output queue without having first sent a valid query to the instrument. In this condition, the signal generator has nothing present in the output queue and is not in the process of generating a response to a query. Thus the instrument cannot respond to the controller's request for data.

Error 79: IEEE-488.2 INTERRUPTED Query

Interrupted query occurs when the IEEE-488 controller sends a new character to the signal generator and response data is present in the output queue or the signal generator is generating response data by executing a query. After sending a query to the signal generator, the controller should always be sure to read all of the response data which the generator generates.

Error 80: IEEE-488.2 I/O DEADLOCK

This type of query error occurs when the signal generator has been asked to buffer more data than it has room to store in the output buffer. The signal generator logs this error when the signal generator detects the following three conditions simultaneously:

1. The output buffer is full, thus blocking completion the query which is generating response data.

2. The input buffer is full.

3. The controller is attempting to send a new character to the generator. If these three conditions occur at the same time, the IEEE-488 bus will be blocked (deadlocked) since the controller cannot clear the condition unless it aborts sending the character and begins reading the output buffer.

Error 84: IEEE 488.2 Query after Indefinite Response

This error occurs when a query which generates a response of type <arbitrary response data> is followed by another query without first reading the response.

OPC Operation complete. All commands previous to reception of a *OPC command have been executed, and the interface is ready to accept another message

STATUS REGISTER SUMMARY (cont)

BIT ASSIGNMENTS FOR ISR, ISCR, AND ISCE

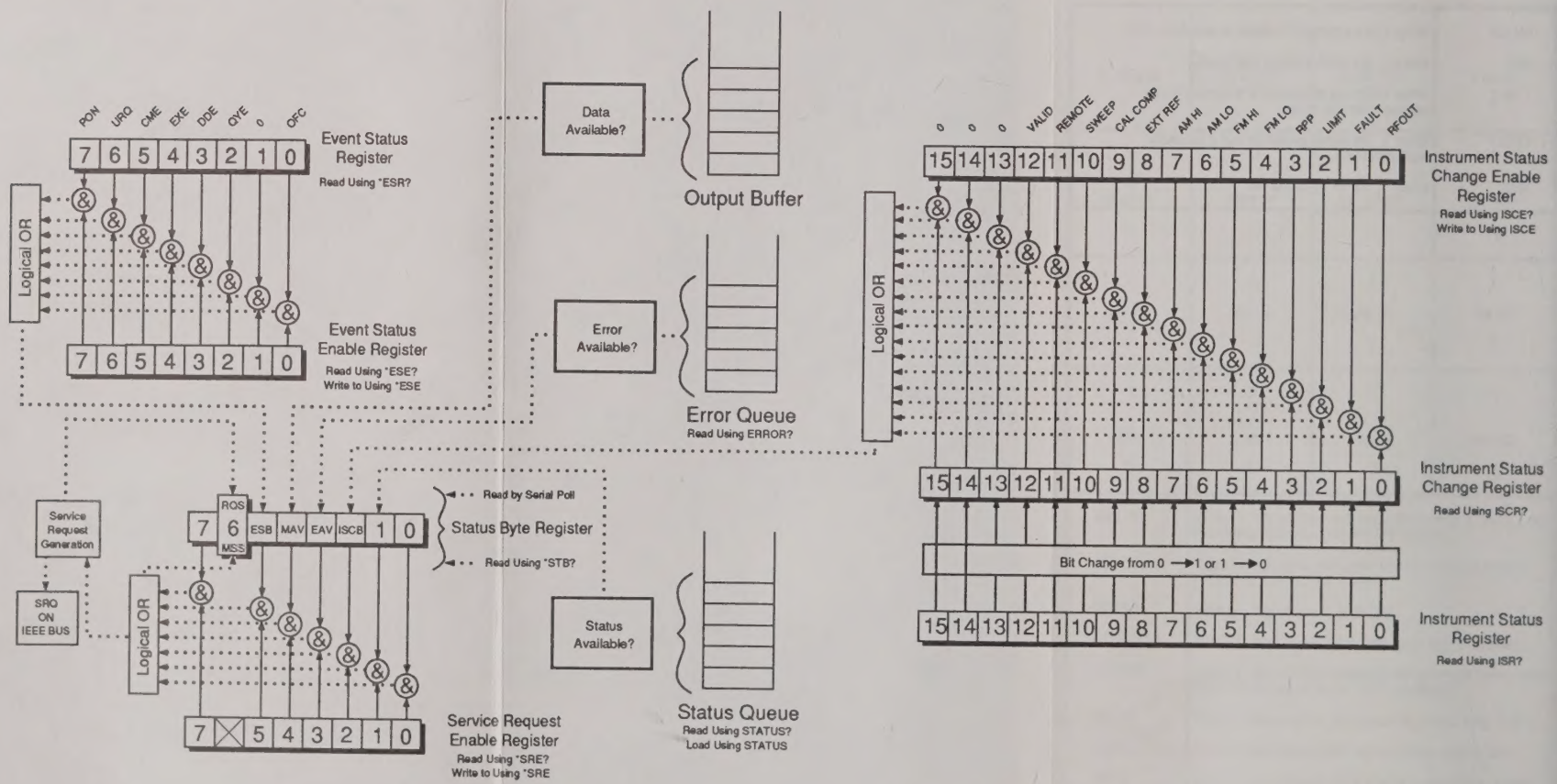
15	14	13	12
ALWAYS 0	ALWAYS 0	ALWAYS 0	VALID ↑
11	10	9	8
REMOTE ↑↓	SWEEP ↓	CALCOMP ↑↓	EXTREF ↑↓
7	6	5	4
AM HI ↑	AM LO	FM HI ↑	FM LO ↑
3	2	1	0
RPP ↑	LIMIT ↑	FAULT ↑	RFOUT ↑↓

VALID	When 1, the external reference frequency is being used (EXTREF switch is in the "EXT" position).
REMOTE	When 1, the signal generator is under remote control (REMOTE annunciator is lit).
SWEEP	When 1, digital sweep is active.
CALCOMP	When 1, the CALICOMP switch is in the "1" position.
EXTREF	When 1, the external reference frequency is being used (EXTREF switch is in the "EXT" position).
AM HI	When 1, the external AM signal is greater than 1.02V.
AM LO	When 1, the external AM signal is less than 0.98V.
FM HI	When 1, the external FM signal is greater than 1.02V.

STATUS REGISTER SUMMARY (cont)

BIT ASSIGNMENTS FOR ISR, ISCR, AND ISCE

FM LO	When 1, the external FM signal is less than .98V
RPP	When 1, the RPP circuitry has tripped.
LIMIT	When 1, the signal generator is operating in a hardware limited region.
FAULT	When 1, the signal generator has a hardware fault condition.
RFOUT	When 1, the RF output is on.


PON URQ CME EXE DDE QYE 0 OPC
7 6 5 4 3 2 1 0
Event Status Register
Read Using *ESR?
Logical OR
Event Status Enable Register
Read Using *ESE?
Write to Using *ESE
Data Available?
Output Buffer
Error Available?
Error Queue
Read Using ERROR?
0 0 0 VALID REMOTE SWEEP CAL COMP EXT REF AM HI AM LO FM HI FM LO RFP LIMIT FAULT RFOUT
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Instrument Status Change Enable Register
Read Using ISCE?
Write to Using ISCE
Instrument Status Change Register
Read Using ISCR?
Bit Change from 0 →1 or 1 →0
Instrument Status Register
Read Using ISR?
Service Request Generation
SRQ ON IEEE BUS
ROS
MSS
ESB MAV EAV ISCB
Read by Serial Poll
Status Byte Register
Read Using *STB?
Status Available?
Status Queue
Read Using STATUS?
Load Using STATUS
Service Request Enable Register
Read Using *SRE?
Write to Using *SRE

SPECIAL FUNCTIONS

SPECIAL FUNCTION DESCRIPTION	FRONT PANEL	REMOTE COMMAND
RF OUTPUT FREQUENCY		
Relative frequency mode	20,21	FREQ_REL
Enable phase adjustment	701	PHASE
Zero phase adjust reference	702	PHASE_ZERO
External ref. input frequency	760,761	EXTREF_FREQ
Low-noise external reference	950, 951	LOWNOISE
RF OUTPUT AMPLITUDE		
Relative amplitude mode	30,31	AMPL_REL
Fixed-range amplitude	50,51	AMPL_RANGE
Amplitude display units	840-843	AMPL
EMF-Volts amplitude display mode	850,851	AMPL_EMFOUT
MODULATION		
Modulation oscillator output	40,41	MODOUT
Modulation frequency to 0.1 Hz	42	MODF
Low-rate FM	710,711	LORATEFM
High-rate ØM	720,721	HIRATEPM
Low-distortion/fixed-range FM	730-732	FM_RANGE
Internal pulse modulation	740,741	INT_PULSE
Modulation oscillator waveform	750-752,758	MOD_WAVE
Enter pulse width	759	PULSE_WIDTH
SWEEP		
Sweep dwell time	890-899	SWEEP_DWELL
Sweep symmetry	880,881	SWEEP_SYM
Initiate single sweep	882	SWEEP_SINGLE
MEMORY		
Reset memory locations	801	MEM_RESET
Display/Set mem. seq. dividers	802	MEM_DIVIDER
Write-protect memory locations	810,811	MEM_LOCK
Erase nonvolatile memory	829	MEM_ERASE
REMOTE		
Display/Set IEEE-488 address	10	n/a
Display/Set IEEE-488 addr. mode	11	n/a
Display/Set IEEE-488 language	12	GAL
Display/Enter service request mask	13	*SRE
Set user request SRQ	14	n/a
Clear SRQ	15	n/a
MISCELLANEOUS		
Clear special functions	00	SPCL 00
Restore instrument preset state	01	SPCL 01
Initiate power-on self tests	02	*TST?
Display self test results	03	STATUS
Display option loading status	08	*OPT?
Display software revision level	09	*IDN?
Disable display	770,771	DISPLAY
Frequency blanking	780, 781	FREQ_BLANK
Enable secure mode	820, 821	SECURITY
Step key repeat rate	860-862	KEY_RATE
Knob and step key operation	870-873	KNOB_STEP

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